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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/708,642	03/17/2004	Chih-Chung Chuang	ADTP0066USA	2641

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EXAMINER	
GEORGE, PATRICIA ANN	
ART UNIT	**PAPER NUMBER**
1765	

DATE MAILED: 02/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/708,642	CHUANG ET AL.	
	Examiner	Art Unit	
	Patricia A. George	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-20 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-20 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 13 and 19 are rejected under 35 U.S.C. 102(e) as being anticipated by Hong et al. of USPN 6,429,057.

Hong et al. discloses a front end array process for making LCD panel (col.1, l.7-11), comprising: depositing a molybdenum-containing metal gate layer which consists of gate lines, gate pads, and gate electrodes that can have a single or multiple layered structure (see fig. 3, 22, 24, 26 or col.10, l.55-67), and is deposited on a silicon substrate (fig. 2, 10 or col.1, l.34-37). Hong teaches the use of photolithography masking (ab.) followed by dry etch (i.e. uses gas mixture, col.7, l.15-45) to pattern the molybdenum-containing metal layer/s for forming both gate and data wire (i.e. word line, col. 11, l.20-25).

Hong's first embodiment teaches use of dual layers of Al-Nd and Mo-W, and it is known and preferable to use dry etch for this combination of materials (col.12, l.38-46).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.
>
> This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 1, 6, 7, and 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hong in view of Rioux of USPN 5,554,488.

Hong et al. discloses a front end array process for making LCD panel (col.1, l.7-11), comprising: depositing a molybdenum-containing metal gate layer which consists of gate lines, gate pads, and gate electrodes that can have a single or multiple layered structure (as in applicants' claim 6, see fig. 3, 22, 24, 26 or col.10, l.55-67), and is deposited on a silicon substrate (fig. 2, 10 or col.1, l.34-37). Hong teaches the use of photolithography masking (ab.) followed by dry etch (i.e. uses gas mixture, col.7, l.15-45) to pattern the molybdenum-containing metal layer/s for forming both gate and data wire (i.e. word line, col. 11, l.20-25).

Hong's first embodiment teaches use of dual layers (as in applicants' claim 6) of Al-Nd and Mo-W, and it is known and preferable to use dry etch for this combination of materials (col.12, l.38-46).

Hong fails to teach substantially oblique sidewalls (as in applicants' claim 1, and 14).

Rioux teaches a conventional method of forming Mo containing (col.5, l.57) metal gate (col.5, l.49) with tapered sidewalls (i.e. oblique sidewalls), formed on the surface of a semiconductor substrate (i.e. glass; col.5, l.34-35), through use of well known photolithography and dry etch methods (col.6, l.51-59), as in claims 1, 6, and 14.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include the method of tapered sidewalls, of Rioux, when making the front end array process for making LCD panel, of Hong, because Hong teaches it avoids undercutting, and etch damage in subsequent process, an known process improvement.

As to claim 7, Hong does not specifically point out top and bottom layers, as in applicants' claim 7, but Hong's first embodiment teaches use of dual layers of Al-Nd and Mo-W (col.12, l.38-46), as in applicants' claim 7.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to form LCD panels with gate layers of dual materials, as in Hong, by selecting the order of deposition of the layers, the Aluminum containing film being first, the bottom layer, and the Moly containing film being second, the top layer, because Hong teaches the combination of materials in that specific order AL-Nd, first, then Mo-W, second.

Claim Rejections - 35 USC § 103

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hong (see discussion above) in view of Przybysz et al. (USPN 4,904,980).

The combined teachings of Hong fail to disclose that dry etch includes an over etching when etching the Mo containing metal layer, as in claims 2 and 15.

Kim et al. teaches a fabrication method for forming an array substrate of a liquid crystal display. Kim teaches the over etching of Mo is known and common in prior art (p.0027, l. 4), as in claim 15.

Przybysz et al. teaches the overetch is commonly emplored during the etching of Mo because it is necessary, to allow time for the pattern to become fully defined (Description of the preferred embodiments -paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to combine the overetch, as taught by Kim in prior art, with the liquid crystal display invention, of Hong, because both Kim and Prybysz indicate it is a conventional process that will allow time for the Mo-containg pattern to become fully defined, which avoids line defects.

Claim Rejections - 35 USC § 103

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hong as applied above, in further view of Cheung et al. (USPN 5354417).

The combined teachings of Hong are silent about the etching of a molybdenum-containing metal layer executed under a process pressure higher than 25 mTorr, as in claim 17.

Cheung teaches use of SF6, HBr (col. 2, l.63), and an oxygen containing gas (col.2, l.64) for an improved selective etching of a substrate (col.2, l.60) having molybdenum-containing layer (col.2, l.61). Cheung teaches the combination of Cl2 and O2 is typical (col.1, l.21-22) but they cause problems including "reentrant" profiles (col.1, l.29-30). Cheung teaches the process pressure at a range of 1 mTorr to 300 mTorr when etching a molybdenum-containing metal layer, which is encompasses the range of higher than 25 mTorr, in claims 17.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include the improvement of an increase etch rate using an increase the process pressure when etching a molybdenum-containing metal layer, as taught by Hong, with the method for producing a liquid crystal display device that includes a matrix substrate, disclosed by Hong, because it is a well known in the art that a high process pressure improves the process by using the abundance of the reactive species available, with the results of an increased the etch rate, a known process improvement.

Claim Rejections - 35 USC § 103

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hong, as applied above, in view of Nagata et al. (JP405067590A).

The teachings of Hong fail to disclose the etching of the molybdenum-containing metal layer is detected by a detection method which will detect a wavelength of about 704 nm, as in claim 18.

Nagata et al. teaches the etching of a film that has a fluorocarbon with a peak of light emission in of about 700nm (ab.), which is very different than the ordinary resist wavelength of 480nm. Nagata teaches the use of a second material to conduct the etching and when the fluorocarbon film is exposed, an intensity of 704nm (ab.) is detected.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include the end point detection method of Nagata, in an etch used to produce a liquid crystal display device, as disclosed by Hong, because Nagata teaches even when a stepped area exists and the etch rate is not uniform, the end point can be easily and accurately be detected.

Claim Rejections - 35 USC § 103

Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hong et al. of USPN 6,429,057 (see discussion above).

Hong does not specifically point out top and bottom layers, as in applicants' claim 20.

Hong's first embodiment teaches use of dual layers of Al-Nd and Mo-W (col.12, l.38-46), as in applicants' claim 20.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to form LCD panels with gate layers of dual materials, as in Hong,

by selecting the order of deposition of the layers, the Aluminum containing film being first, the bottom layer, and the Moly containing film being second, the top layer, because Hong teaches the combination of materials in that specific order AL-Nd, first, then Mo-W, second.

Claim Rejections - 35 USC § 103

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hong and Rioux (see discussions above) in view of both Kim et al. (US 2003/0122987) and Przybysz et al. (USPN 4,904,980).

The combined teachings of Hong and Rioux fail to disclose that dry etch includes an over etching when etching the Mo containing metal layer, as in claim 2.

Kim et al. teaches a fabrication method for forming an array substrate of a liquid crystal display. Kim teaches the over etching of Mo is known and common in prior art (p.0027, l. 4), as in claim 2.

Przybysz et al. teaches the overetch is commonly emplored during the etching of Mo because it is necessary, to allow time for the pattern to become fully defined (Description of the preferred embodiments -paragraph 4).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to combine the overetch, as taught by Kim in prior art, with the liquid crystal display invention, of Hong and Rioux, because both Kim and Prybysz indicate it is a conventional process that will allow time for the Mo-containg pattern to become fully defined, which avoids line defects.

Claim Rejections - 35 USC § 103

Claims 3, 9, 10, 11, 12, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hong and Rioux, as applied above, in further view of Hori et al. of USPN 5445710.

The combined teachings of Hong and Rioux do not disclose the specific gas mixtures or ratio of claims 3, 9, 10-12, and 16.

Hori et al. teaches dry etching method of a substrate containing carbon; patterning the film through a resist mask; using a gas plasma; with fluorine and O2 gases. Hori teaches an embodiment that includes chlorine, as well as fluorine and O2 gases. Hori teaches plasma etch with the presence of carbon atoms from a film. Hori also teaches etch gases containing fluorine atoms and oxygen atoms are mixed at an atomic ratio of fluorine to oxygen to 198:1 to 1:2. Hori's ratio range encompasses the range claimed in the instant invention. In example 3, Hori used a variety of gases with oxygen (O2-col.16, l.66), including: chlorine (Cl2-col.17, l.3), fluorine (SF6-col.17, l.3), and chlorine (Cl2) and fluorine (SF6) combined (col. l.18).

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to modify the LCD manufacturing method, disclosed by Hong and Rioux, by modifying the etchant gas mixtures and ratios, as taught by Hori, because Hori teaches combinations that improve the results of dry etching (col.1, l.18).

Claim Rejections - 35 USC § 103

Claims 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hong and Rioux, as applied above, in further view of Cheung et al. (USPN 5354417).

The combined teachings of Hong and Rioux are silent about the etching of a molybdenum-containing metal layer executed under a process pressure higher than 25 mTorr, as in claims 4.

Cheung teaches use of SF6, HBr (col. 2, l.63), and an oxygen containing gas (col.2, l.64) for an improved selective etching of a substrate (col.2, l.60) having molybdenum-containing layer (col.2, l.61). Cheung teaches the combination of Cl2 and O2 is typical (col.1, l.21-22) but they cause problems including "reentrant" profiles (col.1, l.29-30). Cheung teaches the process pressure at a range of 1 mTorr to 300 mTorr when etching a molybdenum-containing metal layer, which is encompasses the range of higher than 25 mTorr, in claims 4.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to select an etch rate of greater than 25mTorr for etching the molybdenum-containing metal layer in the modified teachings of Hong because Cheung (5,354,417) illustrates such a pressure is effective for accomplishing the desired etch.

Claim Rejections - 35 USC § 103

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hong and Rioux, as applied above, in further view of Celii et al. (USPA 10/282621).

The combined teachings of Hong and Rioux are silent about the dry etch being controlled by a source power, a bias power, process pressure, oxygen flow rate and

flow rate of fluorine containing gas, as in claim 5.

Celii et al. teaches an exemplary approach to plasma etching that is bases on Cl2 and a fluorine gas, with an oxidizer such as O2, where he controls the process temperature (para.128, l.7). Celii teaches controlling the process pressure (para. 108, l.8), the source power (para.108, l.10) , and bias power para.108, l. 10-11), as in claim 5. Celii also teaches controlling gas flow rates (see pg. 9, tables 3-5) as in claim 5.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include that dry etch is controlled by source power, a bias power, process pressure, oxygen flow rate and flow rate of fluorine containing gas, as taught by Celii, with the method for producing a liquid crystal display device that includes a matrix substrate, disclosed by Hong and Rioux, because Celii teaches alterations and modifications of various aspects will occur to others skilled in the art (para. 176, l.2-3).

Claim Rejections - 35 USC § 103

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hong and Rioux, as applied above, in further view of Nagata et al. (JP405067590A).

The combined teachings of Hong and Rioux fail to disclose the etching of the molybdenum-containing metal layer is detected by a detection method which will detect a wavelength of about 704 nm, as in claim 8.

Nagata et al. teaches the etching of a film that has a fluorocarbon with a peak of light emission in of about 700nm (ab.), which is very different than the ordinary resist

wavelength of 480nm. Nagata teaches the use of a second material to conduct the etching and when the fluorocarbon film is exposed, an intensity of 704nm (ab.) is detected.

It would have been obvious to one of ordinary skill in the art at the time of invention was made, to include the end point detection method of Nagata, in an etch used to produce a liquid crystal display device, as disclosed by the invention of Hong and Rioux, because Nagata teaches even when a stepped area exists and the etch rate is not uniform, the end point can be easily and accurately be detected.

Response to Arguments

Applicant's arguments, on pages 6 and 9, filed November 1, 2005, with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection set forth to address applicants' amendment.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Patty George whose telephone number is (571)272-5955. The examiner can normally be reached on weekdays between 7:00am and 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571)272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Patricia A George
Examiner
Art Unit 1765

PAG - 12/05